**Docket No. SA-537**

**Exhibit No. 6-AA**

# NATIONAL TRANSPORTATION SAFETY BOARD

**Washington, D.C.**

Air Cruisers Presentation
Airplane Cabin Crashworthiness & Occupant Protection

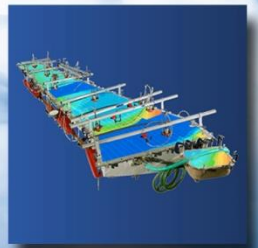
(10 Pages)

# Air Cruisers Company

ZODIAC AEROSPACE

## NTSB Investigative Hearing, 10-11 December 2013
## Asiana Airlines Flight 214 (B777) Landing Accident at SFO








MASTERING THE ELEMENTS

ZODIAC AEROSPACE

# Introduction

- Air Cruisers was founded in 1929 as maker of Aviation Safety Equipment
- Manufactured “Mae West” Life Preservers and Barrage Balloons during WW2
- Invented & patented Inflatable Evacuation Slides in 1950’s
- Air Cruisers was purchased by Zodiac in 1987 which became Zodiac Aerospace in 2007








ZODIAC AEROSPACE

# What is an Evacuation Slide?

- Safety device that rapidly inflates for emergency evacuation from an aircraft
- Required on commercial aircraft when exit height exceeds 6 feet from ground
- Normally installed inside the cabin on the door, or housed in an external fuselage compartment
- Many slide designs double as a raft for ditching (water landings)







ZODIAC AEROSPACE

# Typical Primary Major Components

- **Packboard & Lacing cover**
  - Contains slide assembly
  - Provides mounting hardware to attach to the aircraft door
- **Inflatable tube structure**
- **Inflation System**
  - Compressed gas reservoir
  - Valve/Regulator
  - Hose(s)
  - Aspirator(s)
- **Survival Kit (for slide/rafts)**
  - Includes Raft Canopy

# Typical Slide Particulars


Top Latch
(Attaches to aircraft)

Valve Safety Pin
(Remove before flight)

Backside of Packboard

Lower Attach Fittings
(Attach to aircraft)

Aspirator

Pack Release Safety Pin
(Remove before flight)

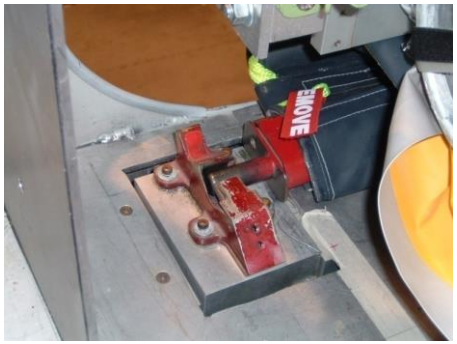
Girt Bar
(Attaches to floor fittings)

Release Mechanism

Girt

# How Does an Evacuation Slide Work?

- The Packed Slide System is installed on the aircraft
- The “Girt Bar” is attached to the aircraft floor fittings
- When the aircraft door is “armed” and opened a cable is tensioned that releases the Slide pack from its packboard
- The Slide begins to drop downward and the inflation cable is pulled, opening the valve to initiate inflation








ZODIAC AEROSPACE

# How Does an Evacuation Slide Work?

- Gas rushes to the Aspirators, opening their flappers which entrain ambient air
- The unfolding of the Slide occurs in stages, controlled by frangible attachments (links)
- The Aspirator flappers close when the slide pressure builds
- The Slide is rapidly inflated and immediately ready for use once fully extended

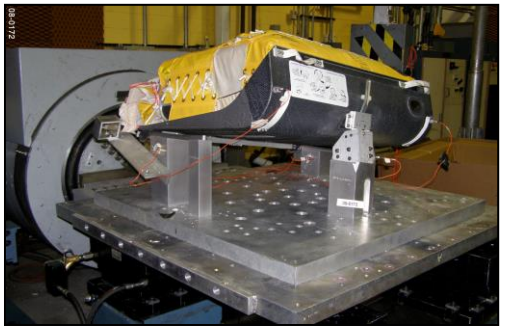



# What are the Requirements?

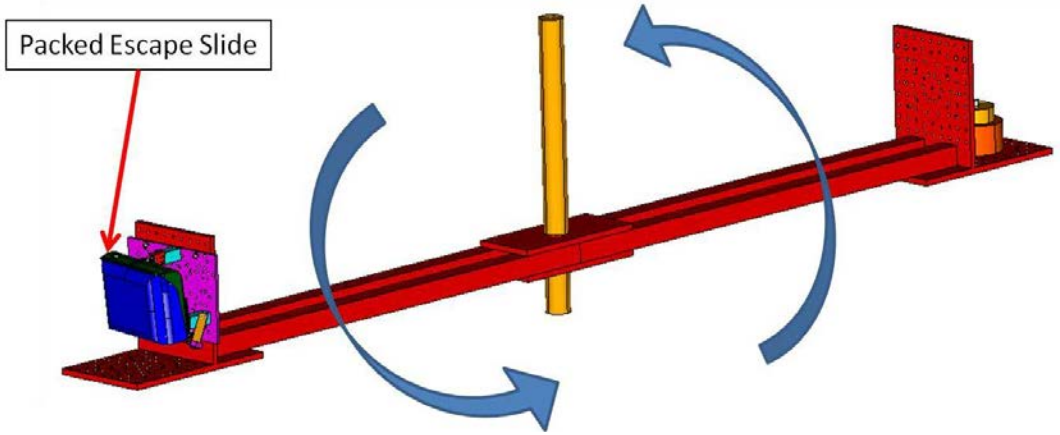
- **FAA TSO-C69c is the primary governing document**
- **Typical Slide Design/Test programs take 3-4 years to complete**
- **TSO-C69c Performance Requirements include:**
  - Inflation Time – maximum 6 seconds
  - Evacuation Rate (minimum) 70 persons per minute per lane
  - Deploy in 25 knot wind
  - Resist the Environment (sand, dust, salt spray, fluids, rainfall, etc.)
  - Radiant Heat Reflective Fabric
  - Flame Resistance and Smoke and Toxicity requirements per applicable FARS.
  - Resist Temperature extremes (-40 to +160 deg. F)
  - Function at Adverse Attitudes (Any combination Landing Gears out)
  - Function in Water Landing “Ditching” conditions
  - Usable as deflated “chute”

# What are the Requirements?

Vibration & Shock



- **Additional Requirements from OEM's for certification of the aircraft**
  - Vibration
  - Shock
  - On-Aircraft repeatability
  - Full Scale Evacuation Demonstration per FAR 25.803
  - Acceleration Loads per FAR Part 25.810 (a) (1) (v)










ZODIAC AEROSPACE

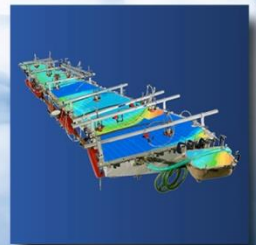
# Air Cruisers Company

## *Commited to the Safety of the Flying Public*

ZODIAC AEROSPACE

# THANK YOU








MASTERING THE ELEMENTS

ZODIAC AEROSPACE